MAELIA-ORM

An integrated assessment and modelling tool for territorial management of organic resources

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The organic resources (OR) system

The wide diversity of organic ressources and stakeholders

- **OR** : manure, food wastes, crop residues, digestate, urban sludges
- **Stakeholders** : farmers, biomass plants, waste water treatment facilities, agro-food industries, compost platforms

Optimization of organic resources (OR) territorial management

Use of organic resources has multiple impacts on the territory

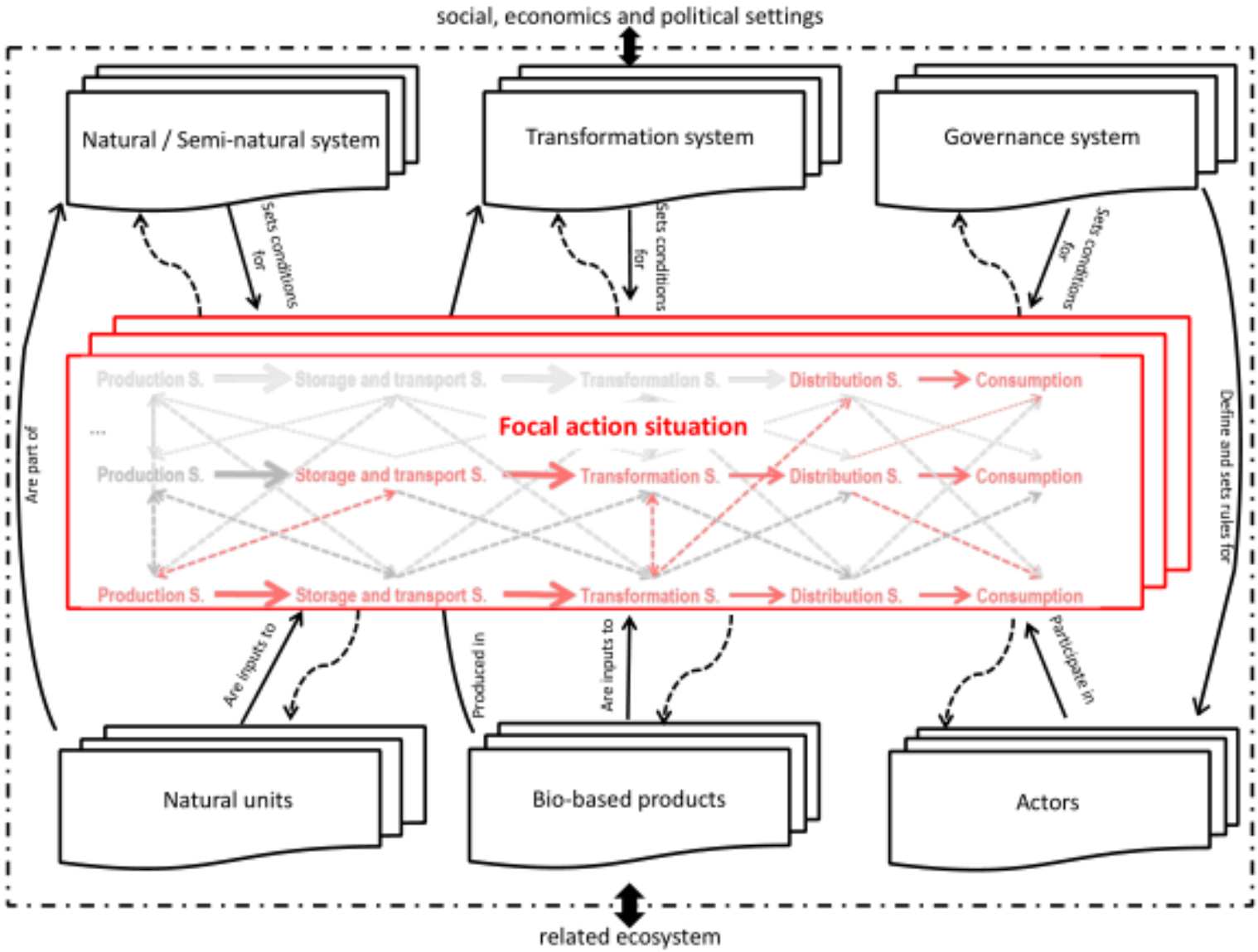
- **Environmental** : soil health → soil structure → ecosystem services
- **Economical** : economic performance of farms, territorial economy organization
- **Social** : farmers' work load, social networks

OR management : a multi-level challenge

- **Field** : fertilization strategies, cropping system × available OR
- **Farm** : OR management by farmers (e.g. application work load)
- **Individual OR chain** : production → transformation → consumption
- **Territory** : collective optimization of OR management and impacts

› How to optimize OR chains taking into account the specifities of each chain and farm and the objectives regarding their effects?

The social-ecological system perspective



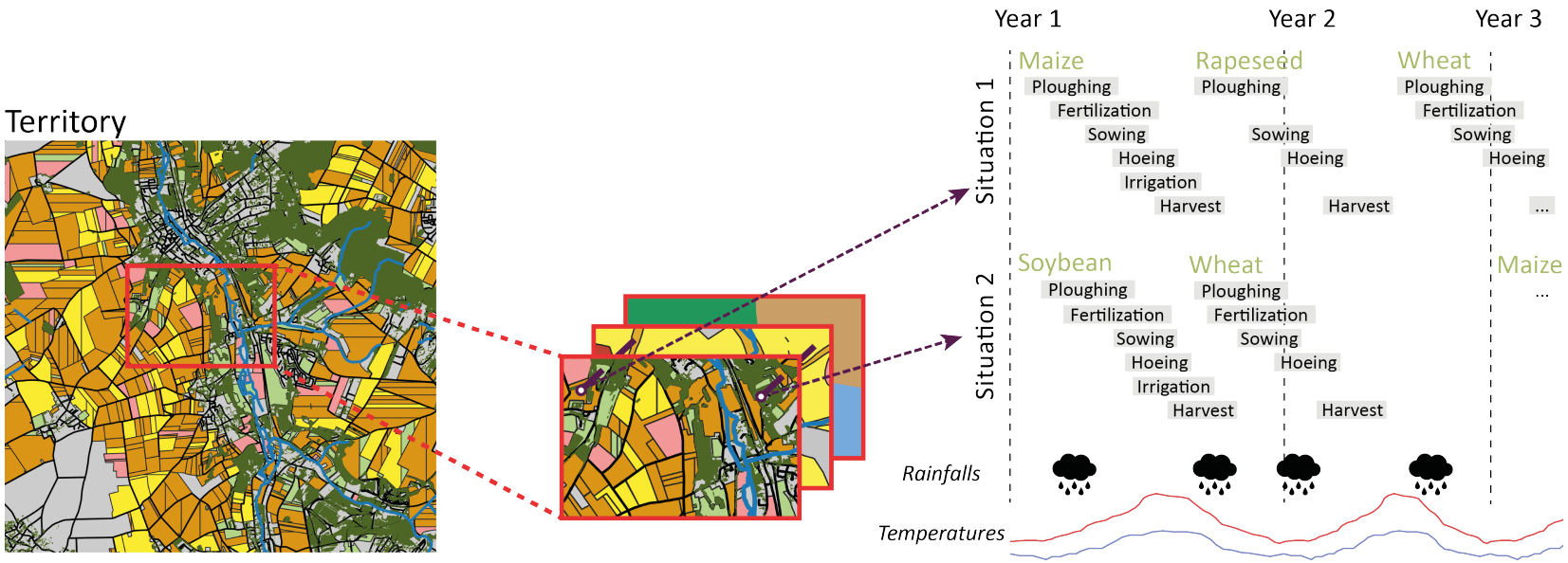
What tool for modelling and simulating OR management?

MAELIA

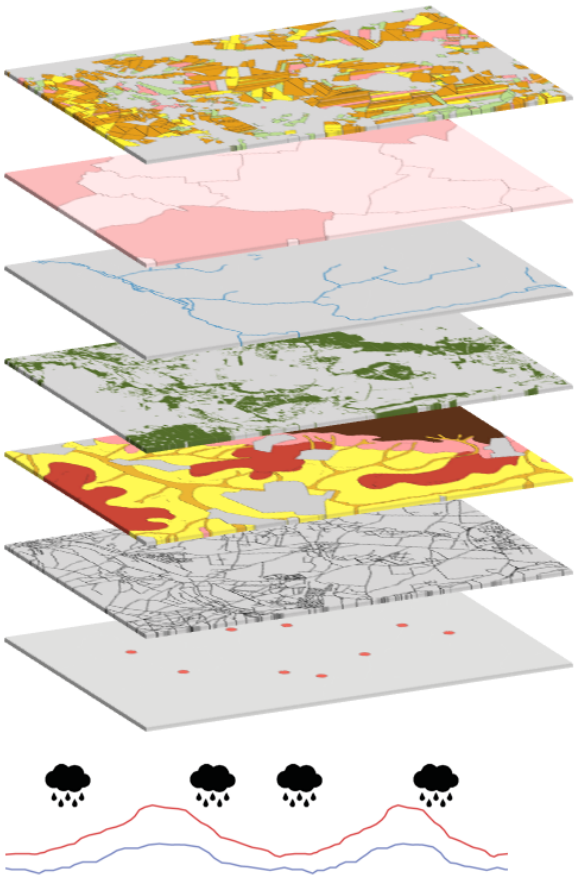
GAMA

MAELIA : a agent-based model that **simulates agricultural territories** for the integrated assesment (multi-criteria – multi-level) of the management of natural resources (inclunding ecosystem services)

Individual dynamics of plots and farmers (based on decision rules) :



Spatial data inputs : structure of the social-ecological system



Plots, crop rotations, agricultural practices

Administrative bouderies, population

Hydrosystem (rivers, lakes, dams, reservoirs)

Forests

Pedological data

Road network

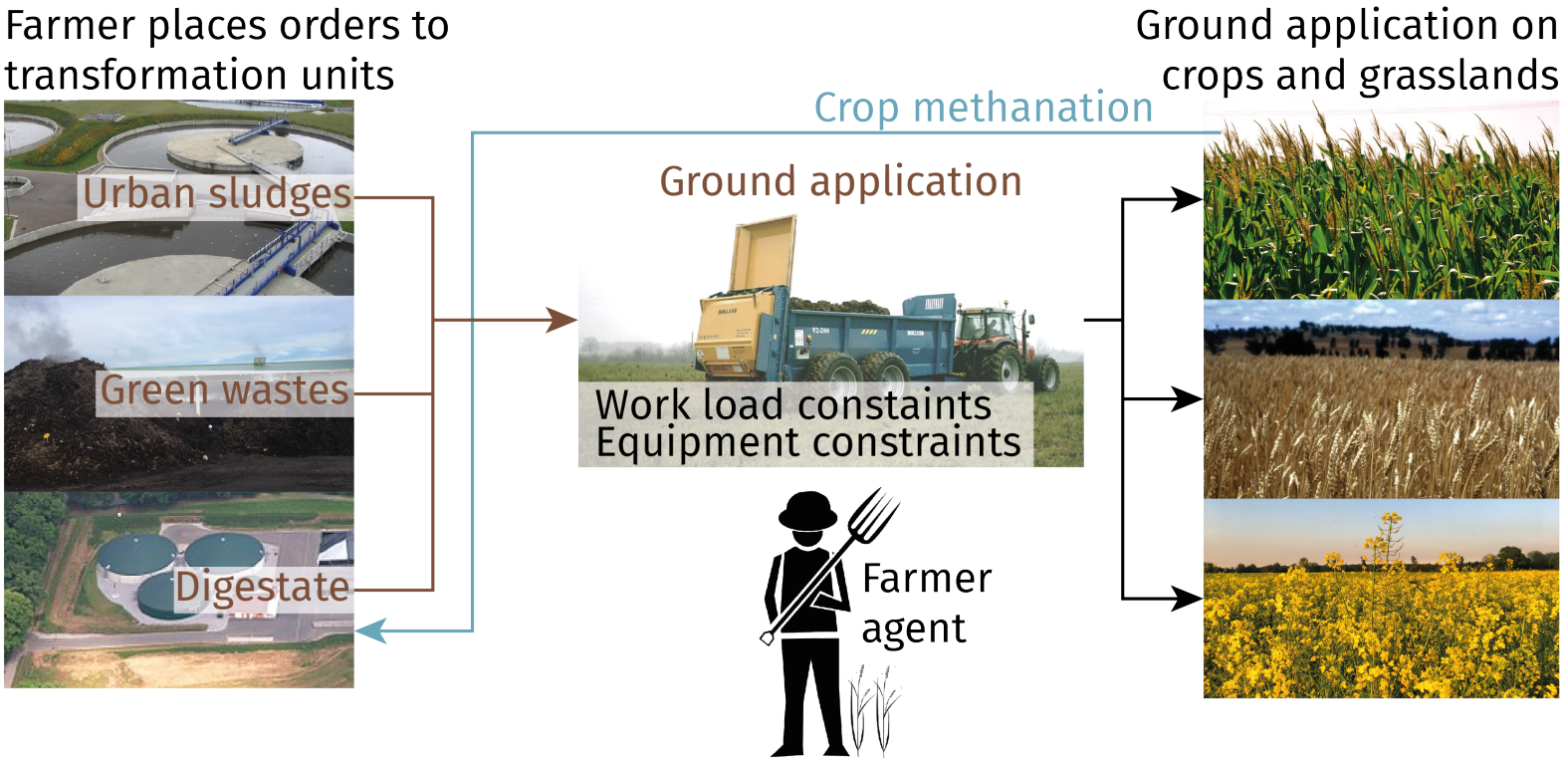
Organic resources processors

Spatially-explicit meteorological data (past and projected)

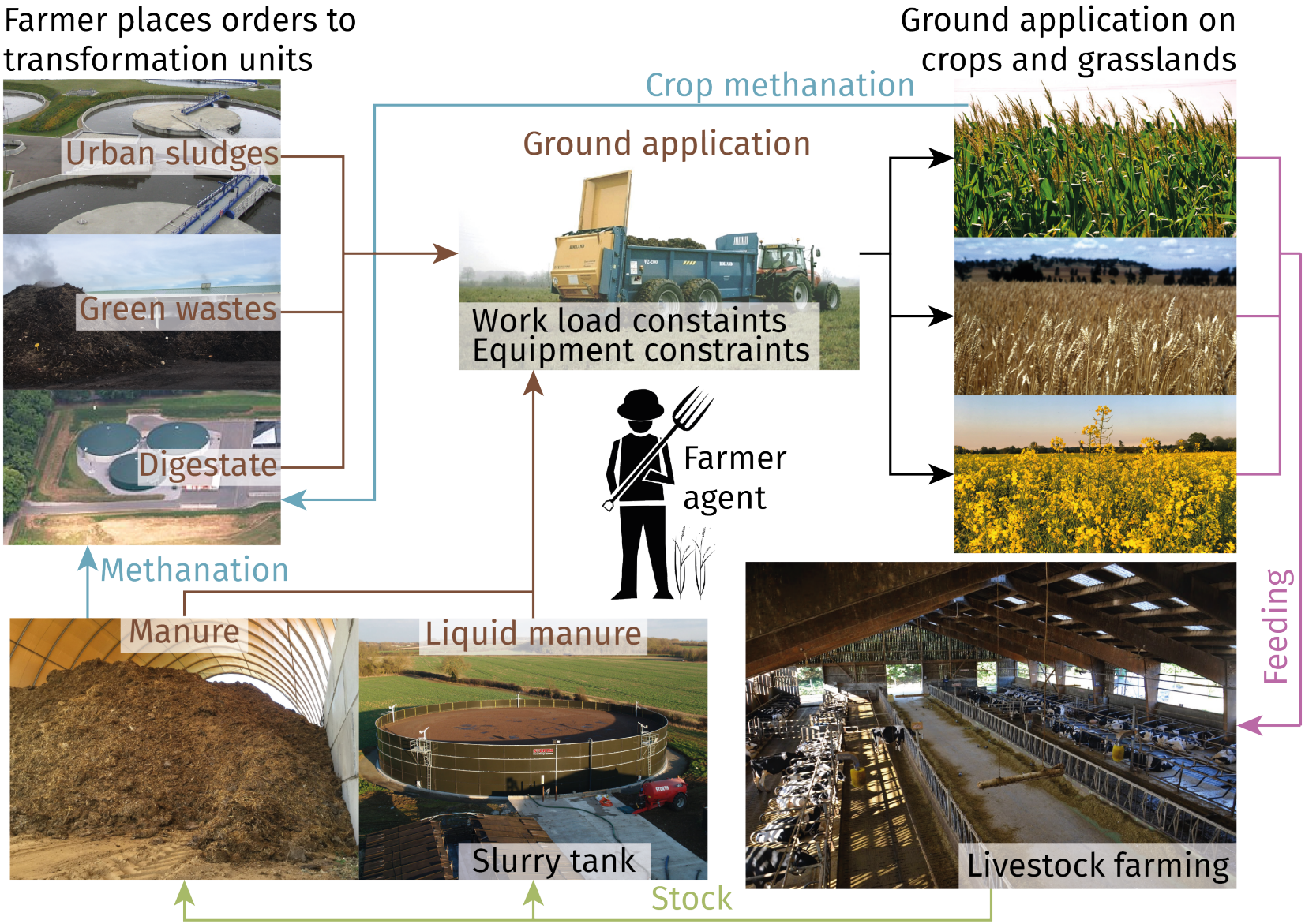
MAELIA-ORM : a multi-scale modelling tool for territorial organic resources management (ORM)

Field scale : evaluate / enhance organic products effects

Farm scale : decision rules for OR management



Farm scale : decision rules for OR management



Chain scale : production, transformation, consumption

Organic resources chain characteristics

- Simulate biomass flows
- Simulate the OR market (taking into account costs & distances)
- Transformation units use recipes and order/sell products
- Transformation dedicated algorithms (e.g. methanation)

Example : the composting chain

Territorial scale : scenarios assessment

Implement governance scenarios

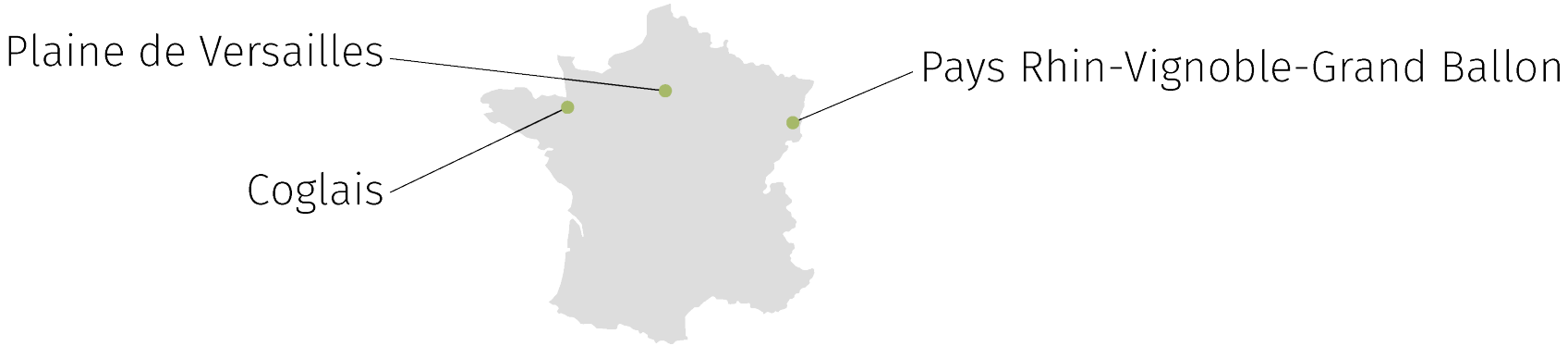
- Farmer aids
- Changes in institutional constraints
- Transformation unit construction
- Climate change

Territorial simulations

Evaluate effects with indicators

- GHG emissions
- Economical performances
- Ecosystem services
- Sustainability

PROTERR project : MAELIA-ORM tested on 3 territories



Coglais

- livestock farming
- Maize, wheat & grasslands
- Biomass plant project

Plaine de Versailles

- Wheat & rapeseed
- Urban sludges
- OR from the netherlands (beetpulp residues)

Pays Rhin-Vign.-G.B.

- Maize monoculture
- Low OR avaibility, Little livestock
- Biomass plant projects

Perspectives

Challenges ahead : build scenarios with stakeholders

Perspectives : to develop MAELIA's modular architecture

Thank you for your attention